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ICESat (GLAS) Science Processing Software Document Series

Volume
GSAS Version Description
Version 1.0

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Foreword

This document contains the GLAS Science Algorithm Software (GSAS) Version Description document. This document is developed under the structure of the NASA STD-2100-91, a NASA standard defining a four-volume set of documents to cover an entire software life cycle. Under this standard a section of any volume may, if necessary, be rolled out to its own separate document. This document is a roll- out of the user guide within the Product Specification Volume.

The GEOSCIENCE LASER ALTIMETER SYSTEM (GLAS) is a part of the EOS program. This laser altimetry mission will be carried on the spacecraft designated EOS ICESat (Ice, Cloud and Land Elevation Satellite). The GLAS laser is a frequency-doubled, cavity-pumped, solid state Nd:YAG laser.

This document was prepared by the Observational Science Branch at NASA GSFC / WFF, Wallops Island, VA, in support of B. E. Schutz, GLAS Science Team Leader for the GLAS Investigation. This work was performed under the direction of David W. Hancock, III, who may be contacted at (757) 824-1238, hancock@osb.wff.nasa.gov (e-mail), or (757) 824-1036 (FAX).

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Section 1

Introduction

1.1 Identification of Document

This is the Version Description document for the Version 1 delivery of the GLAS Science Algorithm Software (GSAS). The unique document identification number within the GLAS Ground Data System numbering scheme is *TBD*. Successive editions of this document will be uniquely identified by the cover and page date marks.

1.2 Scope of Document

The GLAS I-SIPS Data Processing System, shown in Figure 1-1, provides data processing and mission support for the Geoscience Laser Altimeter System (GLAS). I-SIPS is composed of two major software components - the GLAS Science Algorithm Software (GSAS) and the Scheduling and Data Management System (SDMS). GSAS processes raw satellite data and creates EOS Level 1A/B and 2 data products. SDMS provides for scheduling of processing and the ingest, staging, archiving and cataloging of associated data files. This document is the Version Description for the GSAS Version 1 delivery.

1.3 Purpose and Objectives of Document

The purpose of this document is to provide a precise description of Version 1 of GSAS.

1.4 Document Organization

This document's outline is assembled in a form similar to those presented in the NASA Software Engineering Program [Information Document 2.3a].

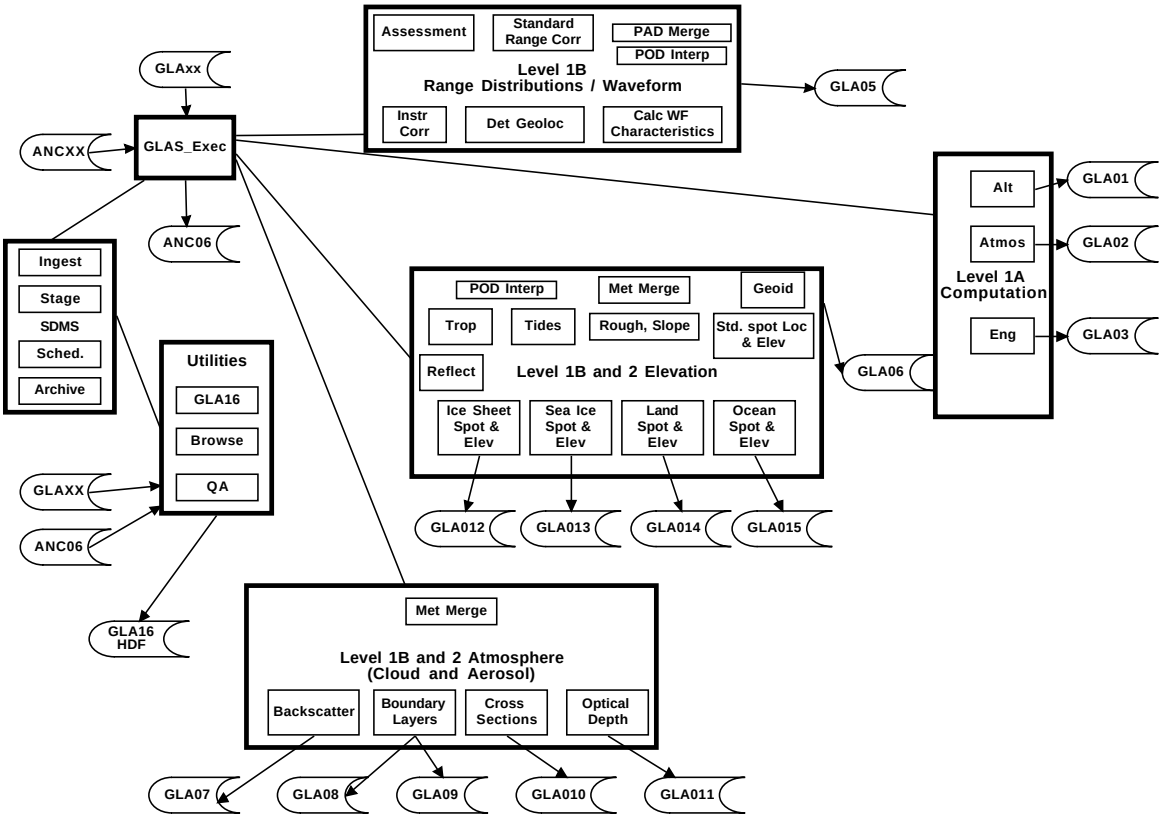

Figure 1-1 I-SIPS Software Top-Level Decomposition

1.5 Document Change History

Document Name: GLAS Science Algorithm Software Version Description		
Version Number	**Date**	**Nature of Change**
Version 0	July 1999	Original Version.
Version 1	November 2000	Revised for V1 software.

Section 2

Related Documentation

2.1 Parent Documents

Parent documents are those external, higher-level documents that contribute information to the scope and content of this document. The following GLAS documents are parent to this document.

a) *GLAS Science Software Management Plan* (GLAS SSMP), Version 3.0, August 1998, NASA Goddard Space Flight Center, NASA / TM-1999-208641 / VER3 / VOL1.

The GLAS SSMP is the top-level Volume 1 (Management Plan Volume) document of the four volumes of NASA software engineering documentation [Applicable Reference 2.2c]. It dictates the creation and maintenance of the Product Specification Volume (Volume 2). This document is a roll out of the Product Specification Volume.

2.2 Applicable Documents

a) NASA Software Documentation Standard Software Engineering Program, NASA, July 29, 1991, NASA-STD-2100-91.

b) GLAS Science Algorithm Software Detailed Design Document, Version 1.0, October 20000, NASA Goddard Space Flight Center.

c) GLAS Science Algorithm Software User's Guide, Version 1.0, October 2000, NASA Goddard Space Flight Center.

d) GLAS ISIPS Operational Procedures Manual, TBD.

2.3 Information Documents

a) GLAS Level 0 Instrument Data Product Specification, Version 2.2, March 17, 1998, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2610.

b) GLAS Standard Data Products Specification - Level 1, Version 2.0, January, 1999, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2621.

c) GLAS Standard Data Products Specification - Level 2, Version 2.0, January, 1999, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DPS-2641.

d) GLAS Science Data Management Plan (GLAS SDMP), Version 4.0, June 1999, NASA Goddard Space Flight Center Wallops Flight Facility, GLAS-DMP-1200.

Section 3

Product Description

3.1 Purpose

GSAS generates the GLAS Standard Data Products and associated metadata describing the products and their quality. The software uses GLAS telemety and ancillary data to produce the products using algorithms defined by the GLAS Science Team.

GSAS is delivered as a set of libraries and executables. The main processing software is GLAS_Exec. It is accompanied by a set of utilities which perform various data transformations and computations. The design and structure of GSAS is fully described in the GSAS Detailed Design Document.

Throughout this document, files are referenced as one of two types: GLA or ANC. GLA files are integer-binary format product files containing Level 0-2 GLAS science data. The GLA files are fixed-length binary files containing scientific measurements. GLA files are both input and output to GSAS. ANC files are multi-format ancillary files supplied by the science team which are required for processing. These files are detailed in the GLAS Data Management Plan and GLAS Standard Data Product Specifications Documents.

3.2 Environment

GSAS software is developed for and delivered on the UNIX platform. This document assumes that the reader is familiar with UNIX operating system conventions. The software is currently supported only on the HP/UX 11.0 operating system with Fortran 90 version v2.3.

3.3 Functions

The GSAS functions for V1 are:

- Read GLAS telemetry data and standard data products and ancillary files. Provide time-synchronization between product and ancillary files and between multiple products.
- Create all standard data products in an integer-binary format. These data products are grouped into the following categories:
  - Level-1A products. (GLA01-03)
  - Waveform products. (GLA05)
  - Atmosphere products. (GLA07-11)
  - Elevation products. (GLA06,GLA12-15)
- Perform selective processing based on input and output defined in a user-supplied control file.

- Create metadata which contains a full processing history.
- Report errors and messages in a standardized fashion with user-defined options available.
- Read changeable parameters from Science Team-supplied ancillary files.
- Convert product data into human-readable output.
- Create sample (but not scientifically accurate) test products.

3.4 Restrictions and Limitations

The V1 delivery of the GSAS has the following limitations:

- The software has the capability of processing many different scenarios. However, only tested scenarios are supported. These scenarios are:
  - One processing string to create all L1A products (GLA00 to GLA01-03).
  - One processing string that starts with a waveform product (GLA05) input to produce all elevation products (GLA06, 12,13,14,15).
  - One processing string that starts with L1A atmosphere (GLA02) input and produces L2 atmosphere products (GLA07,08,09,10,11).
  - One processing string that starts with a waveform product (GLA05) input to produce a primary elevation product (GLA06).
- The Atmosphere Manager does not handle certain situations with invalid data correctly. This case occurs in the second granule of the multi-granule atmosphere integration test. The team decided to fix the problem in V2. Thus, the Atmosphere Manager is only reliable when using the first granule of the multi-granule test set. The integration test and acceptance test documentations reflect this restriction.
- GLAS_Exec will not be run with mixed precision / predict orbit files in the same run. A sanity check will enforce this constraint in Version 2.
- GSAS will **not overwrite** existing files.The software will halt with a fatal error unless old output files are removed before execution.
- Quality assurance output is not required for Version 1 and is implemented only in the Atmosphere and Waveform subsystems. The data contained is currently meaningless and should be ignored.
- Only the integer-binary format of the GLAS standard data products will be generated. Headers will be added in theV2 delivery.
- It is assumed all input data are time-aligned with no missing or error data.
- No process sanity checking is delivered in this version. This will be added in the V2 delivery.
- GLA00 data will be in a test format. This format combines all APID files into a single file and provides header structures to ease data input. Support for the

operational format of the GLA00 data will be delivered in a build with the GLAS L0 Processor (a separate utility).

- GLA00 data will not support a direct run of the software to create data from GLA00 through GLA15. Software support is implemented, but the team is not generating realistic GLA00 test data.
- Regional masks are not implemented. All data will be written to GLA12-15.
- The GSAS is supported on HP/UX 11.0 with HP Fortran 90 compiler version 2.3.
- In a production environment, the GSAS would be controlled by the SDMS. The SDMS would produce control files, stage data, and control execution of the GSAS binaries. This document, however, is limited to GSAS and thus will not describe procedures within the scope of SDMS.

Section 4

Inventory and Product

4.1 Materials Released

Materials released include software code, documentation, static ancillary data and test data. These materials are delivered on physical media. Due to the size of ancillary and test data, a DLT tape shall be used as the distribution media. The documentation is delivered in form of Adobe PDF (Portable Document Format) files and, by request, hardcopy.

4.2 Product Content

To extract the GSAS Version 1 software, change to an appropriate directory (suggested at least 4GB available on the disk) and use the tar command to extract the software from distribution media.

When the tape is un-tarred, a gsas_v1 directory and several sub-directories will be created. Table 4-1 lists the top-level directories. describes the top-level directories.

Table 4-1 Top-level Content

Item	Description
bin	Directory where executables are stored.
cc_util	Make utilities.
data	Science-team provided static-ancillary files.
docs	Documentation in PDF format.
lib	Directory where shared libraries are stored.
Makefile	Distribution Makefile.
src	Source code.
test	Sample products and testing area.

The bin and lib directories are delivered without content. They will be populated during the installation process. The remainder of this subsection describes content of the other directories.

4.2.1 Makefile utilities (cc_util)

This directory contains GSAS-standard makefile utilities. These files are used in GSAS makefiles and can be modified to change such things as compile-time options in a consistent manner.

Table 4-2 cc_util Content

Item	Description
cc_make_final.sh	Clearcase glue script to ease installation.
make_defs.	Symbolic link to make_defs.hp
make_defs.hp	HP-specific Makefile definitions.
make_defs.incl	Generic Makefile definitions.
make_depends.incl	Makefile dependencies.

4.2.2 Ancillary Data (data)

Initial versions of the science-team supplied ancillary data files as well as sample control files are included in this release. These files are located in the data directory of the tarfile and are designated Version 1.0.

Table 4-3 data Content

Item	Version	Description
anc07_001_00_00.dat	v1b4	Error and Status file. Generated by development team.
anc07_001_00_01.dat	1.1	Global constants file. Generated by development team.
anc07_001_00_02.dat	1.1	Atmosphere constants file. Generated by development team.
anc07_001_00_03.dat	1.0	Elevation constants file. Generated by development team.
anc07_001_00_04.dat	1.0	Waveform constants file. Generated by development team.
anc07_001_00_05.dat	1.2	L1A constants file. Generated by development team.
anc12_001_00_00.dat	n/a	DEM header. Generated by development team from anc12_001_00_01.dat.
anc12_001_00_01.dat	n/a	DEM. From GTOPO30 (U.S. Geological Survey's EROS Data Center)
anc13_001_00_00.dat	n/a	Geoid. EGM96.
anc16_001_00_00.dat	n/a	Load Tide Model file. This was provided by the science team. SPOTL (Duncan Agnew -- SCRIPPS)
anc17_001_00_00.dat	n/a	Ocean Tide Model file. This was provided by the science team. GOT99.2 (Richard Ray -- GSFC)

Table 4-3 data Content (Continued)

Item	Version	Description
anc18_001_00_00.dat	n/a	Standard Atmosphere file. Standard Atmosphere profile file, in house. Pressure and temperature based on LOWTRAN radiative transfer program. Humidity based on Anderson, G. P., S. A. Clough, F. X. Kneizys, J. H. Chetwynd, and E. P. Shuttle, 1986: AFGL atmospheric constituent profiles (0-120 km), AFGL-TR-86-0110, 43 pp. [NTIS ADA175173]
anc30_001_00_00.dat	n/a	Global aerosol categorization map file. This was provided by the science team.
anc31_001_00_00.dat	n/a	Aerosol tropospheric classification map file. This was provided by the science team.

4.2.3 Documentation (docs)

The required delivery documentation for Version 1 is found in the docs directory. These documents are listed in Table 4-4

Table 4-4 docs Content

Item	Version	Description
gsas_accept_test_v1.pdf	1.0	GSAS Acceptance Test Plan, Version 1.
gsas_ddesign_v1.pdf	1.0	GSAS Detailed Design Document, Version 1.
gsas_user_guide_v1.pdf	1.0	GSAS User's Guide, Version 1.
gsas_ver_desc_v1.pdf	1.0	GSAS Version Description, Version 1 (this document).
glas_prod_spec_1_v1.pdf	3.0	GLAS Standard Data Product Spec - Level 1
glas_prod_spec_2_v1.pdf	3.0	GLAS Standard Data Product Spec - Level 2
glas_smp_v1.pdf	3.0	GLAS Science Software Management Plan
glas_dmp_v1.pdf	4.0	GLAS Data Management Plan

4.2.4 Source (src)

Contents of the src directory are described in detail within the GSAS Detailed Design Document. Table 4-5 lists each major subdirectory and it's corresponding executable / library version number. The inconsistent version numbering is a known problem and documented as such in Section 5.

Table 4-5 src Content

Item	Version	Description
atm_lib	n/a	Links atmosphere code into library structure.
atmosphere	v1.r3	Development code for atmosphere code.

Table 4-5 src Content (Continued)

Item	Version	Description
elev_lib	n/a	Links elevation code into library structure.
elevations	v1p3	Development code for elevations code.
GLAS_Exec	v1_prod	Main GSAS processing routine.
lib	n/a	Development shared library directory. (initially empty)
l1a	n/a	<unused>
l1a_lib	v1p3	Development directory for L1A code
Makefile	n/a	Master source Makefile
modules	n/a	Development module directory. (initially empty.)
prod_readers	n/a	Utility -product readers/writers.
waveforms	v1p3	Development directory for waveforms code
wf_lib	n/a	Links Waveforms code into library structure.
common_libs/anc_lib	v1_prod	Development directory for anc_lib.
common_libs/cntrl_lib	v1_prod	Development directory for cntrl_lib.
common_libs/err_lib	v1_prod	Development directory for err_lib.
common_libs/file_libt	v1p3	Development directory for file_libt.
common_libs/geo_libt	v1_b3	Development directory for geo_libt.
common_libs/math_lib	1.0	Development directory for math_lib.
common_libs/platform_lib	v1_prod	Development directory for platform_lib.
common_libs/prod_lib	v1p3	Development directory for prod_lib.
common_libs/time_lib	v1p3	Development directory for time_lib.

4.2.5 Testing and Sample Products (test)

The testing directory is fully described in the GSAS Acceptance Test Procedures.

Section 5

Change Status

The Version 1 (V1) delivery of GSAS contains major changes from Version 0 (V0). The most important change is the integration of the science algorithms into GLAS_Exec.

5.1 Installed Changes

5.1.1 Science Algorithms

Implemented changes defined in Version 1 of the science algorithm ATBDs. Integrated science algorithms into Managers with requisite changes. These changes are documented in the respective ATBD.

5.1.2 Data Products

Version 1 of the data products were implemented as described in the GLAS Standard Data Product Specifications - Level 1 and 2 and the respective ATBDs. This includes requisite support for nearest-integer rounding and invalid values. Flags are now packed and unpacked in support routines. The entire product conversion process is documented in the GSAS Detailed Design.

5.1.3 Shared Libraries

Switched from statically-linked '.a' libraries to dynamic, shared '.sl' libraries. Affected makefiles were modified accordingly.

5.1.4 Version Modules

Those libraries which lacked version modules have now been given version modules. Also, instead of one version number for ANC07 (since ANC07 can be a multiple-file input), there is a separate version number for each "section" of ANC07 data. The version numbers themselves have not been updated in a consistent fashion. This is a known problem and documented as such.

5.1.5 GLAS_Error

In V0 development, the team recognized a problem using GLAS_Error during the initialization phase. GLAS_Error required that ANC07 be read before it was fully functional. This made GLAS_Error nearly useless when doing such things as opening files and reading ANC07. In V1, GLAS_Error is initialized with a set of error conditions which will include a base set of errors states. These predefined errors will be overwritten with the errors read after successful execution of the ANC07 error initialization section. Formatting is also changed such that error messages written to the console are more readable.

The meaning of the signs for GLAS_Exec has been reversed to reflect standard conventions. Positive numbers represent informational messages used for tracing program flow. Negative numbers represent error or warning conditions.

Some problems were found in the GLAS_Error routines when used outside the GLAS_Exec context. As GLAS_Error is designed to be a generic error routine for multiple pieces of GLAS software, these errors have been corrected. Also, a routine to "boot" GLAS_Error so that it is useful before ANC07 is read had been added. Previously, this boot code existed in MainInit, but was cumbersome to add to each program which uses GLAS_Error. Also, a major error was found in testing where reinitializing GLAS_Error multiple times would cause inconsistent results. The coding structure was rewritten to handle this case and errors –09999 to 00000 were reserved for internal hard-coded GLAS_Error errors.

GLAS_Error was split into generic and GLAS_Exec-specific portions. GLAS_Error now uses direct array indexing instead of searching through an array of numbers. This causes (nearly) all error numbers to be changed. Also split the ERROR and STATUS parts of the ANC07 structure because of the way ordering occurs with negative numbers.

5.1.6 ANC07 File Changes

ANC07 parameters may be placed in one or more ANC07 files. Like ANC07 parameters are grouped into sections and delimited by keywords BEG_OF_section to END_OF_section. Sections may not be broken across files. There are now separate modules for reading the contents of each section. The number of parameters in each section is now dynamically calculated.

5.1.7 No More Interactive Control

The interactive portion of GetControl has been removed. GLAS_Exec will display an error if it is called without a control file name as its argument.

5.1.8 Module Variable Initialization

In order to prevent reported memory leaks with uninitialized module variables, all variables in modules are initialized with an invalid or "0" value.

5.1.9 Sample Product Readers/Writers

Sample product readers and writers have been updated/created for the products defined in v1. These programs should be used as an example of how to use the GLAS libraries outside of GLAS_Exec (in utilities etc.). The writer has two options: when run with –time as a command line option, the writer will create 4 hours worth of the appropriate data using A2P conversions. This is to allow timing results that are not impacted by writing debug output. When run without –time, the writer will create files containing x seconds human-readable product, algorithm, and scaling values. The first record in these output files contains the initialization value of each variable, then progresses from minimum value to maximum value, incrementing by the formula increment=(max-min)/x.

5.1.10 Keyval sizes

The size of keyval % kval was changed from 80 to 255 in order to handle ANC07 L1A arrays.

5.1.11 Time Library

Received and compiled the GSFC/Raytheon time library and created a Makefile which allows it to coexist nicely with other GLAS software. This legacy code is part of the GLAS software library as of this release. To use the time library routines, link in the time library with –Ltime.

5.1.12 Math Library

Received and compiled c_bilin_interp_mod.f90. This is a common interpolation routine. This code was added to the math library.

5.1.13 Meteorological Files

Used existing code to implement the anc01 met file module. The module holds the type definition, the global data structure, the read routine, and a print routine. The file units of the two opened met file sets are stored in the global met structure. To access the met header data, link in the anc_lib (-Lanc) and use the anc01_met_mod (use anc01_met_mod).

5.1.14 Standard Atmosphere File

Used existing code to implement the anc18 standard atmosphere file module. It is part of the anc_lib. The module holds the type definition, the global data structure, the read routine, and a print routine.

5.1.15 Waveform Control Addition

Added a new keyword to the control file and added the waveform control flags.

5.1.16 Filenames

Due to length of proposed filenames, the length of the names in the fStruct module was changed to a larger length (from 40 to 80).

5.1.17 QAP Output Files

Data quality output files are opened according to the control file. There is one QAP file available pre-granule. The order of QAP files of the same type should follow the order of the corresponding GLA files in the control file.

5.1.18 DEM Files

Implemented the anc12 DEM file module. It is part of the anc_lib. The module holds the type definition, the global mask data structure and the read routine.

5.1.19 Geoid File

Implemented the anc13 Geoid file module. It is part of the anc_lib. The module holds the type definition, the global data structure and the read routine.

5.1.20 Cycle/Rev Keywords

GetControl has been modified to accept multiple Cycle/Rev keywords in the control file. These keywords will be used for metadata. The entries will be identified with

their respective start and stop times. GSAS won't actually do anything with these values until product header / metadata information is coded.

5.1.21 Dynamic File Opening/Closing

Have implemented changes where input and output files are opened and closed on demand instead of being opened at start of processing and closed on end of processing. The existence of requested input files are still verified using the INQUIRE command during the file initialization phase.

5.1.22 fCntl_mod

Renumbered the file indices so that ANC07 is read before any of the other ANC files.

5.1.23 PAD

Have changed the PAD structure to an array of 40. This was done in consultation with the elevation developer. Time is converted from MJD to J2000. This should not impact developers since they are all using existing code. The reader is forced to skip the PAD header.

5.1.24 Record Synchronization

Moved initial met file header reads to ReadAnc. ReadData is now more modular and (hopefully) easier to understand. Added code to allow for a 0.25 second slop in the time comparisons. Added code to re-initialize data to invalid when a record later than the current time (due to a time gap) is read.

5.1.25 Control File Mods

Modified the control file reader to handle the SDMS multi-section control file format. The required changes to the control files are that the start of the GLAS_Exec section of the control file must be signified by the section header.

Additionally, the version number was removed as a separate field in the INPUT_FILE and OUTPUT_FILE lines. GLAS has structured the file naming convention such that the version is an integral part of the name.

5.1.26 POD

Created the anc09_pod_mod.f90. Modified ReadAnc to fill the POD file structures. Also created a global variable which will designate predicted or precision orbit. Added code to handle that logic. In discussing this, a constraint was made that GLAS_Exec will not be run with mixed precision / predict orbit files in the same run. A sanity check will be added to GLAS_Exec at a later time to enforce this constraint.

5.1.27 Rotation Matrix

Created the anc24_rot_mod.f90. Modified ReadAnc to fill the Rotation file structures.

5.1.28 geo_lib

Due to software maintenance issues related to ClearCase, created a new geo_lib library which contains links to the following routines:

- c_calcsploc_mod.f90
- c_legacyintrppod.f90
- c_intrppod_mod.f90

This library was created by linking to routines in the elevations directory, thus allowing the library to be created without having ownership and permission problems. These routines are now available to other subsystems.

5.1.29 ANC30 and ANC31

Used existing code to create data structures and read routines for ANC30 Global Aerosol Categorization map file and ANC31 Aerosol Tropospheric classification map. To use the data, “use anc30_aer_mod” and “use anc31_trop_mod”, respectively. The data files have been named and placed in the data directory.

5.1.30 ANC16 and ANC17

Used existing code to set up file structures for load tide and ocean tide files.

5.1.31 Met structure modification

Due to a duplicate typing conflict between anc01_met_mod.f90 and A_types_mod.f90, the met header data structure in anc01_met_mod.f90 was renamed from “met_type” to “met_hdr_type”.

5.2 Waivers

- GLA00 data will be in a test format. This format combines all APID files into a single file and provides header structures to ease data input. Support for the operational format of the GLA00 data will be delivered in a build with the GLAS L0 Processor (a separate utility).
- GLA00 data will not support a direct run of the software to create data from GLA00 through GLA15. Software support is implemented, but the team is not generating realistic GLA00 test data.
- Regional masks are not implemented. All data will be written to GLA12-15.

5.3 Possible Problems and Known Errors

The software development team uses Change Requests (CR) and Problem Reports (PR) to identify problems in the software. Table 5-1 lists the PRs and CRs open for V1. These will be corrected by V2 delivery.

Table 5-1 Open or Suspended PR/CRs in Version 1

PR/CR	Short Description
PR20001006-001	Change to consistent version numbers.
PR20001005-002	Inconsistent arguments in call to W_Calc2ndDer.

Table 5-1 Open or Suspended PR/CRs in Version 1 (Continued)

PR/CR	Short Description
PR20000906-001	Some GLA03 values are off
PR20000901-001	d_pred_scHt in GLA01 does not seem to be set.
CR20000825-001	PAD values on GLA07-11 need to be changed to possible invalids
PR20000824-003	On GLA02 d_gndret_pksig and d_gnd_ret_loc are not matching the unit test case.
PR20000814-001	For reprocessing, need to get PAD from product GLA07
PR20000711-001	Molecular backscatter profiles on GLA07 should be changed from int*2 to int*4
CR20000627-001	Change Variable for GLA08 QA
CR20000626-001	Change the Surface Type from logical to integer in GLA06,GLA12-15
CR20000524-002	Control file input modification request and sanity checks
PR20000523-003	Changes to Scaling Factor in GLA05 Variables
PR20000523-002	GLA05 variables are not passed through
PR20000518-001	Processing Improper order of start and stop times for input files.
CR20000517-001	Add Control/Global variable to override PAD use in GLA05
CR20000508-002	The PAD/POD quality flags have been left off of GLA10 &11
CR20000503-001	Add Bad Frame flag to GLA06, GlA12-15
PR20000419-001	Build 1 Test 1 ANC06 Inconsistency
PR20000412-004	Recording Process information in ANC06.
PR20000412-003	Detecting Inconsistency in the Control File
PR20000412-002	Failure to Process specified number of Records
PR20000412-001	GLAS_Exec incorrect handling of improper start and end times
CR20000314-001	Saturation flags and backscatter profiles

5.4 Requirements Not Supported in the V1 Delivery

Requirements from the GLAS Science Software Requirements Document that are not supported in the V1 delivery of the I-SIPS software and shown in Table 5-2.

Table 5-2 Requirements Not Supported

Requirements Number	Description	Status
GSDP-30100	The I-SIPS Software will create GLAS standard products that are to be delivered to the DAAC in the format agreed to by ESDIS.	original
GSDP-30204	GLA04 records shall span one second. The GLA04 is a multifile product, containing individual files for the LRS, LPA, Instrument Star Tracker, Gyro, GPS, Ball Star Trackers, and spacecraft attitude and position data. One granule of GLA04 shall contain the time span of the EDOS level 0 delivery. The precision will be maintained as that on the level 0 data.	derived
GSDP-30603	GLA04 shall be created when the PDS is made available by EDOS. Input spacecraft telemetry data shall include the Position, Rate, and Attitude Packet (PRAP), and the GPS packet.	derived
GSDP-30900	Metadata will include an assessment of the software performance.	original
GSDP-31100	The I-SIPS Software shall produce metadata describing the data products and their quality.	original
GSDP-31101	Each granule will have corresponding Metadata that will be delivered.	derived
GSDP-31102	Each SDP granule will have a corresponding Quality Assurance granule.	derived
GSDP-31103	Each granule will have a corresponding browse product.	derived
GSDP-31300	Automatic or manual Quality Assurance (QA) is provided for each standard data product and ancillary file. Until QA is completed, the file shall be marked as invalidated. Upon successful completion of QA, the file shall be marked as validated.	original

Abbreviations & Acronyms

EOS	NASA Earth Observing System Mission Program
EOSDIS	Earth Observing System Data and Information System
GLAS	Geoscience Laser Altimeter System instrument or investigation
GSFC	NASA Goddard Space Flight Center at Greenbelt, Maryland
GSFC/WFF	NASA Goddard Space Flight Center/Wallops Flight Facility at Wallops Island, Virginia
ID	Identification
LASER	Light Amplification by Stimulated Emission of Radiation
LIDAR	Light Detection and Ranging
N/A	Not (/) Applicable
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
POD	Precision Orbit Determination
TBD	to be determined, to be done, or to be developed
UNIX	the operating system jointly developed by the AT&T Bell Laboratories and the University of California-Berkeley System Division

Glossary

aggregate	A collection, assemblage, or grouping of distinct data parts together to make a whole. It is generally used to indicate the grouping of GLAS data items, arrays, elements, and EOS parameters into a data record. For example, the collection of Level 1B EOS Data Parameters gathered to form a one-second Level 1B data record. It could be used to represent groupings of various GLAS data entities such as data items aggregated as an array, data items and arrays aggregated into a GLAS Data Element, GLAS Data Elements aggregated as an EOS Data Parameter, or EOS Data Parameters aggregated into a Data Product record.
array	An ordered arrangement of homogenous data items that may either be synchronous or asynchronous. An array of data items usually implies the ability to access individual data items or members of the array by an index. An array of GLAS data items might represent the three coordinates of a georeference location, a collection of values at a rate, or a collection of values describing an altimeter waveform.
file	A collection of data stored as records and terminated by a physical or logical end-of-file (EOF) marker. The term usually applies to the collection within a storage device or storage media such as a disk file or a tape file. Loosely employed it is used to indicate a collection of GLAS data records without a standard label. For the Level 1A Data Product, the file would constitute the collection of one-second Level 1A data records generated in the SDPS working storage for a single pass.
header	A text and/or binary label or information record, record set, or block, prefacing a data record, record set, or a file. A header usually contains identifying or descriptive information, and may sometimes be embedded within a record rather than attached as a prefix.
item	Specifically, a data item. A discrete, non-decomposable unit of data, usually a single word or value in a data record, or a single value from a data array. The representation of a single GLAS data value within a data array or a GLAS Data Element.
label	The text and/or binary information records, record set, block, header, or headers prefacing a data file or linked to a data file sufficient to form a labeled data product. A standard label may imply a standard data product. A label may consist of a single header as well as multiple headers and markers depending on the defining authority.
Level 0	The level designation applied to an EOS data product that consists of raw instrument data, recorded at the original resolution, in time order, with any duplicate or redundant data packets removed.
Level 1A	The level designation applied to an EOS data product that consists of reconstructed, unprocessed Level 0 instrument data, recorded at the full resolution with time referenced data records, in time order. The data are annotated with ancillary information including radiometric and geometric calibration coefficients, and georeferencing parameter data (i.e., ephemeris data). The included, computed coefficients and parameter data have not however been applied to correct the Level 0 instrument data contents.

Level 1B	The level designation applied to an EOS data product that consists of Level 1A data that have been radiometrically corrected, processed from raw data into sensor data units, and have been geolocated according to applied georeferencing data.
Level 2	The level designation applied to an EOS data product that consists of derived geophysical data values, recorded at the same resolution, time order, and georeference location as the Level 1A or Level 1B data.
Level 3	The level designation applied to an EOS data product that consists of geophysical data values derived from Level 1 or Level 2 data, recorded at a temporally or spatially resampled resolution.
Level 4	The level designation applied to an EOS data product that consists of data from modeled output or resultant analysis of lower level data that are not directly derived by the GLAS instrument and supplemental sensors.
metadata	The textual information supplied as supplemental, descriptive information to a data product. It may consist of fixed or variable length records of ASCII data describing files, records, parameters, elements, items, formats, etc., that may serve as catalog, data base, keyword/value, header, or label data. This data may be parsable and searchable by some tool or utility program.
orbit	The passage of time and spacecraft travel signifying a complete journey around a celestial or terrestrial body. For GLAS and the EOS ALT-L spacecraft each orbit starts at the time when the spacecraft is on the equator traveling toward the North Pole, continues through the equator crossing as the spacecraft ground track moves toward the South Pole, and terminates when the spacecraft has reached the equator moving northward from the South Polar region.
module	A collection of program statements with four basic attributes: input and output, function, mechanics and internal data.
pass	A sub-segment of an orbit, it may consist of the ascending or descending portion of an orbit (e.g., a descending pass would consist of the ground track segment beginning with the northernmost point of travel through the following southernmost point of travel), or the segment above or below the equator; for GLAS the pass is identified as either the northern or southern hemisphere portion of the ground track on any orbit
product	Specifically, the Data Product or the EOS Data Product. This is implicitly the labeled data product or the data product as produced by software on the SDPS or SCF. A GLAS data product refers to the data file or record collection either prefaced with a product label or standard formatted data label or linked to a product label or standard formatted data label file. Loosely used, it may indicate a single pass file aggregation, or the entire set of product files contained in a data repository.
program	The smallest set of computer instructions that can be executed as a standalone unit
record	A specific organization or aggregate of data items. It represents the collection of EOS Data Parameters within a given time interval, such as a one-second data record. It is the first level decomposition of a product file.
Scenario	A single execution path for a process.

Standard Data Product	Specifically, a GLAS Standard Data Product. It represents an EOS ALT-L/ GLAS Data Product produced on the EOSDIS SDPS for GLAS data product generation or within the GLAS Science Computing Facility using EOS science community approved algorithms. It is routinely produced and is intended to be archived in the EOSDIS data repository for EOS user community-wide access and retrieval.
Subroutine	A program that is called by another program
variable	Usually a reference in a computer program to a storage location, i.e., a place to contain or hold the value of a data item.